ACTIVE LEARNING AND HISTORICAL RESEARCH ON EDUCATIONAL METHODS IN FLUID PRESSURE IN 150TH ANNIVERSARY OF THE JAPANESE SCHOOL SYSTEMS

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Reconstructions of historically valuable teaching materials in Meiji Era

We have been collecting students' physics notes and educational materials by nationwide searches to capture and record the real situation of Japanese education and to elucidate the characteristic formation process since the Meiji Era. Commemorating the 150th anniversary of the Japanese school system, we report what we have accumulated so far. In our recent exploratory research, we have been able to decipher physics lessons based on old textbooks in upper elementary schools, upper secondary schools, junior high schools, teacher's schools, and preparatory departments. We have deciphered collections of teaching materials and students' lecture notes based on the types of textbooks of A. Ganot's used by Ogawa Masataka (Shizuoka Junior High School) and Sakai Sukeyasu (Mito Junior High School), and types of physics textbooks by B. Stewart, given by Sakurai Fusaki (Fifth Senior High School). Furthermore, we have analyzed Active Learning (AL) type physics education recorded by Matuoka's physics-note (Saitama upper elementary school) based on the textbooks written by Gage.

The innovative content of Japanese science education is deeply influenced by Europe and the United States, in particular those developed by Parker's and G. P. Quackenbos' and Stewart's physics, and those that are deeply referring to Ganot's Physics textbooks. We have attempted modern reconstruction of historically valuable materials using ICT-and AL in Fluid Dynamics. For example, we present case studies for improvement of a hands-on experiment on Pascal's Principle, Figure 1, using home-made suction-cup & vacuum-pump and wireless pressure sensors.

AL on Pascal's Principle by using Suction Cup and wireless ICT sensors

We present on how to create simple experimental tools made at home by inexpensive goods from one-dollar stores, even during the COVID-19 pandemic. Modern reconstruction of AL on Pascal's Principle by using suitable experimental devises such as suction cup and vacuum pump, Figure 1. We show non-buoyancy-upward fluid forces for near-vacuum pressures in suction cup, based on the important boundary conditions, which will produce a simple experimental clarification of the Graf's "buoyance paradox" (Graf, 2004) in fluid pressure. Here, the same pressure is achieved by a small hole which connects a suction cup to barometer and wireless sensor zone. The same is done with a thin silicon tube connecting the suction cup to the device zone.

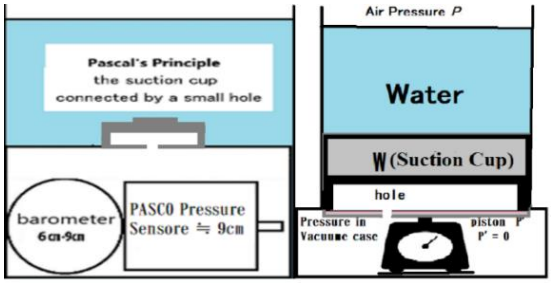

Figure 1. Device setting of Pascal's cylinders

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